2002/03 Annual Combined Sewer Overflow Report

Department of
Natural Resources and Parks
Wastewater Treatment Division

October 2003

King County

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1.1 Introduction

This report is prepared and submitted to the Department of Ecology (Ecology) in accordance with the requirements established within the West Treatment Plant NPDES Permit, No. WA-002918-1 and in WAC 173-245-090. As outlined in the WAC, this report includes:

- An overview and status of King County Department of Natural Resources, Wastewater Treatment Division's (WTD's) CSO Control Program.
- 2002/03 CSO overflow volume and frequency information.
- The formal submission of the annual reports for the Alki (App.1) and Carkeek (App.2) CSO treatment plants.

1.2 Background

King County Wastewater Treatment Division (WTD) provides wholesale wastewater conveyance and treatment for flows from the City of Seattle and thirty-four other cities and sewer districts. Only the City of Seattle collection system contains combined sewers that collect both sanitary sewage and stormwater. Seattle's wastewater collection system conveys flow to County trunks and interceptors, which then convey flows to the County's West Treatment Plant located in Discovery Park. When medium to large storm events occur, flows may exceed the capacity of the collection system pipes, resulting in combined sewer overflows (CSOs) into Lake Washington, Lake Union, the Ship Canal, the Duwamish River, Elliott Bay and Puget Sound (Figure 1-1). CSOs are a recognized source of water pollution that can result in temporary increases in bacterial counts and aesthetic degradation of shorelines during CSO events as well as adversely affect sediment quality at discharge points. CSOs may raise public health concerns in areas where there is potential for public contact. King County has 38, (West Duwamish Siphon (035) has been relisted, but is believed to be controlled to the one per year goal), CSO locations (Figure 1.1).

Since the 1960s, King County has been conducting overflow control projects to improve water quality in the Seattle-King County area. The County first formalized its CSO control program with the development of its *1979 CSO Control Program (1979 Program).* The *1979 Program* identified nine projects to control CSO events into fresh water areas (Lake Washington, Lake Union, and the Ship Canal).

In 1985, new requirements were introduced with the Washington State Water Pollution Control Act (RCW 90.48) requiring all municipalities with CSOs to develop plans for "...the greatest reasonable reduction at the earliest possible date." The County's *1986 Plan for Secondary Treatment Facilities and Combined Sewer Overflow Control (1986 Plan)* was intended to meet this state requirement.

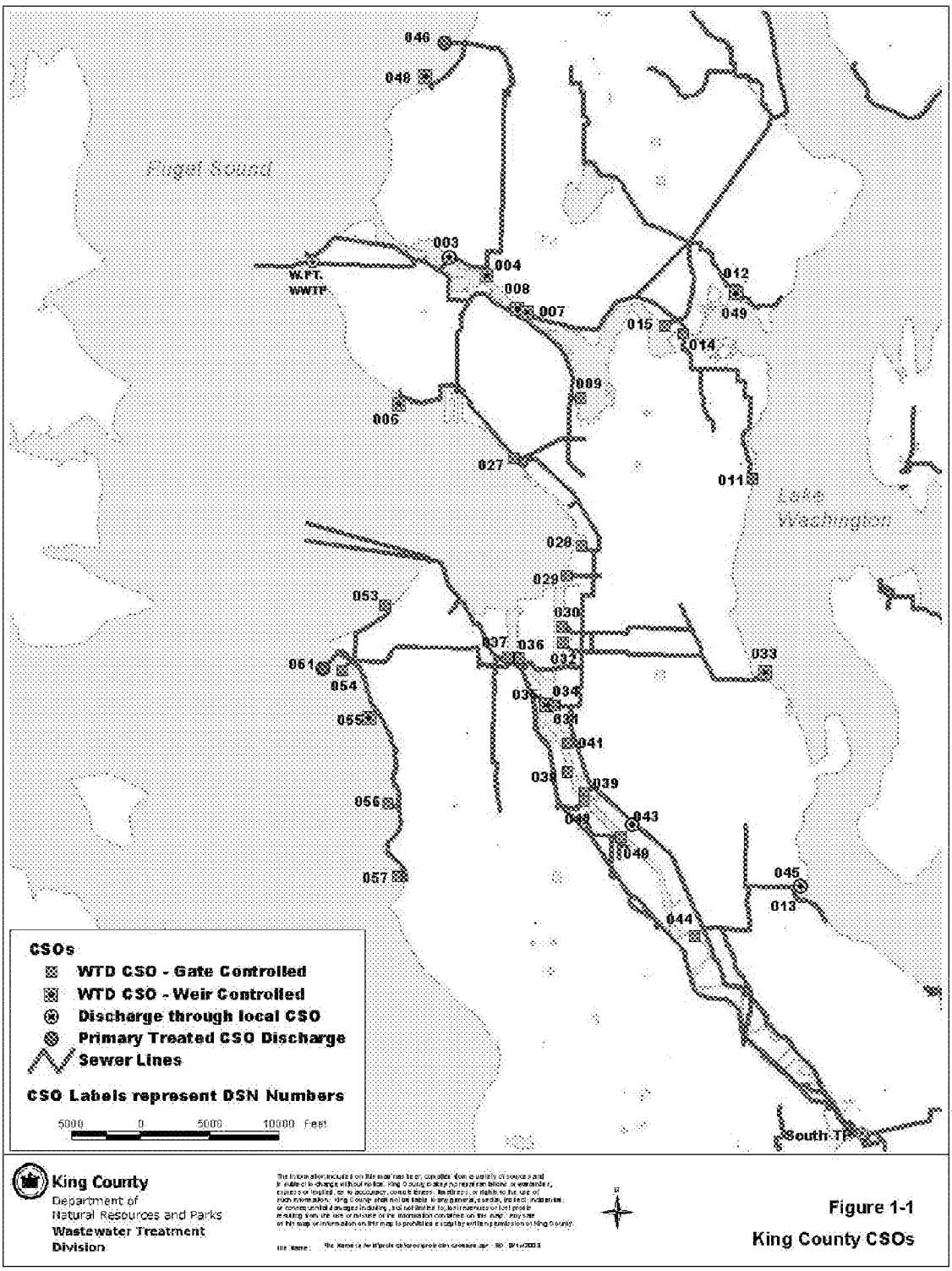

Figure 1-1
King County CSOs

Before the *1986 Plan* was implemented, new regulations were promulgated by Ecology. The new regulations (WAC 173-245-020) defined "greatest reasonable reduction" to mean, "control of each CSO such that an average of one untreated discharge may occur per year.", and required Before the *1986 Plan* was implemented, new regulations were promulgated by Ecology. The new regulations (WAC 173-245-020) defined "greatest reasonable reduction" to mean, "control periodic updates to the control plan. The County worked with Ecology to develop an interim goal of 75 percent reduction of CSO volumes system wide by the end of 2005. The County's *Final 1988 Combined Sewer Overflow Control Plan (1988 Plan)* identified eleven CSO control projects designed to meet this interim goal. This interim goal was later withdrawn by Ecology, allowing the County to prioritize control projects for their protection of human health rather than volume reduction.

As part of the 1995 renewal process for the West Treatment Plant NPDES permit, King County prepared an update/amendment to the *1988 Plan*. The *1995 CSO Update* included an assessment of the effectiveness of CSO reduction efforts to date, a re-evaluation of priority for CSO sites, and identified 3 projects for completion within the 1995-2000 time frame.

In November 1999, the *Regional Wastewater Services Plan (RWSP)* was approved by the King County Council. The *RWSP* outlines wastewater projects to be built up through 2030 to protect human health and the environment, serve population growth, and meet regulatory requirements. The *RWSP* includes the County's amended CSO Control Plan, with twenty-one projects to control the County's remaining uncontrolled CSOs to one untreated event per year on average at each CSO location by 2030, and the removal of the 75 percent interim goal.

An update of the *RWSP's* CSO Control Plan - the *Year 2000 CSO Control Plan Update* – was included in the June 2000 submission of the West Treatment Plant NPDES permit renewal application to Ecology. The *Year 2000 CSO Control Plan Update* documents King County's progress of its CSO control program, compliance with state and federal CSO control requirements as of 2000, and identified two large control projects – Denny and Henderson/MLK/Norfolk - for the next five year NPDES permit cycle.

1.3 Status of CSO Control Projects

1.3.1 Completed CSO Control Projects

Tables 1-1 and 1-2 summarize CSO control and associated projects completed to date by King County.

1.3.2 Current CSO Projects

In the 2000 CSO Plan Update, two continuing projects for CSO control were identified, as constituting the County's control activities for the next NPDES permit cycle (approximately 5 years). They were the:

- Denny/Lake Union CSO Project
- Henderson/Martin Luther King Jr. Way/Norfolk CSO Control Project

Table 1-1 Completed CSO Control Projects

Project	Description	Completion	Status
Diagonal Separation	Determined to be a City of Seattle Project	Early 1990s	Complete per City of Seattle
Ft. Lawton Tunnel	Parallel tunnel to West Treatment Plant providing greater transfer capacity	1991	Complete
CATAD	Computer control of flows to maximize storage in the pipelines	On going	Maintenance and improvement is on going. Anticipated completion in 2005/06 with upgrade of Interbay pump station and implementation of upgraded computer software and hardware.
Hanford/Bayview/ Lander Separation & Storage	Joint City/County partial separation of the Lander and Hanford basins, and reactivation of Bayview tunnel.	1992	Remaining control will occur under RWSP projects in 2017 (Hanford), 2019 (Lander) and 2026 (Hanford at Rainier). Lander stormwater mgmt on going.
Carkeek Transfer/CSO Treatment	Flows up to 8.4 mgd from the Carkeek drainage basin are transferred to West Treatment Plant. Flows above 8.4 mgd are treated at the Carkeek CSO Plant.	Facilities on line in 1994, upgrades underway	The plant was found to receive more flow than anticipated. Construction of improvements is estimated to be completed in 2004.
University Regulator/ Densmore Drain	Separation of Densmore & I-5 stormwater, as well as Greenlake drainage.	1994	Remaining control will occur under a RWSP project in 2015. Densmore stormwater mgmt on going.
Kingdome Industrial Area Storage & Separation	In 1994 a pipeline (used for storage) was laid in conjunction with Seattle and WashDOT street projects. In 1999, the Public Facilities District (PFD) completed 60% of the level 1 separation between Alaska Way and 3rd Ave. in conjunction with stadium construction	1994, 1999	Remaining control will occur under a RWSP project in 2026.
Harbor Pipeline	A pipeline conveys overflow from the Harbor regulator to the West Seattle Tunnel for storage.	1996 (activated in 2000/01)	Operational 2000/01
Alki Transfer/CSO Treatment	Flows up to 18.9 mgd from the Alki drainage basin are transferred to West Treatment Plant via the West Seattle Tunnel. Flows above 18.9 are treated at the Alki CSO plant.	1998	Additional CSO plant modifications were completed in 1999.
63rd Ave. Pump Station	The over flows diverted to West Seattle Tunnel or Alki plant	1998	Close to 1/yr. goal. - Will monitor to check actual performance.

Table 1-2 Completed Associated Projects

Project	Description	Completion	Status
Renton Sludge Force Main Decommissioning	Sludge was pumped via the Elliott Bay Interceptor to West Treatment Plant for processing until South Treatment Plant developed solids management capability; decommissioning decreased solids discharge from Interbay Pump Station at Denny	1988	Complete
Denny Sediment Cap	Pilot sediment remediation project	1990	Remediation of remaining area of contamination is scheduled following overflow control. Overflow control is expected to be completed in 2004 and remediation is expected to occur in the winter of 2004 or 2005.
Ballinger and York pump stations	Construction of these pump stations allows the diversion of separated flows away from the West Point collection system during the wet season.	York P.S. completed in 1992, Ballinger P.S. completed in 1993	complete
West Point treatment plant expansion	Increased plant treatment capacity from 325 mgd to @ 440 mgd. Enables the conveyance and treatment of more flow from the combined sewer system.	1995	complete
Allentown Diversion/Southern Transfer	Designed to offset addition of Alki flows to Elliott Bay Interceptor. Side-benefit of significant volume reduction at Norfolk	1995	Complete
CSO Monitoring Program: NPDES Overflow & Sediments Sediment Baseline	Initial characterization monitoring to identify project priorities; sediment characterization to identify clean up needs	1995, 1997	Complete
CSO Water Quality Assessment of the Duwamish River & Elliott Bay	Complex study to determine existing conditions and the relative contribution of CSO to pollution.	1999	Complete
North Creek pump station	Diverts separated flow away from the West Point collection during wet weather	1999	Complete
Norfolk Sediment Remediation (1)	Source Control, dredging and capping	1999	Follow-up monitoring underway

(1) This project was done under the Elliott Bay/Duwamish Restoration Panel (EBDRP) under the consent decree settling the 1990 litigation by National Oceanic and Atmospheric Administration (NOAA) against the City of Seattle and King County (then Metro) for natural resource damages attributed to CSOs and storm drains.

The Denny/Lake Union CSO project is expected to reduce CSO discharges from approximately 50 untreated discharges at the Denny CSO per year on average to one untreated discharge per year on average. City and County CSOs to Lake Union will also be controlled. At project completion, it is predicted there will be approximately 14 to 20 treated discharges per year through a new outfall at the Denny Regulator. This project is expected to be completed by late 2004. The Henderson/Martin Luther King Way/Norfolk project is projected to reduce CSO at those three locations to one untreated discharge per year on average. Norfolk is predicted to have approximately four treated discharges per year. Completion for this project is expected by late 2004.

1.3.2.1 Denny Way CSO Control Project

The 1986 Plan identified a storage and treatment approach to controlling Denny Way overflows. In the 1988 Plan, the Denny Way project was changed to include partial separation of 584 acres in the Denny/Lake Union and Denny Local drainage basins. Predesign for the project was scheduled to begin in 1993 with construction ending in 1999.

In late 1991, the Seattle Drainage and Wastewater Utility (now Seattle Public Utilities) requested that Metro (now King County Wastewater Treatment Division) participate in a joint analysis of alternatives to control CSO discharges into Lake Union from Seattle's system and into Elliott Bay from the County's system at the Denny Way regulator station. In 1992, a joint Denny Way/Lake Union CSO Control Project was submitted as a candidate for Federal Infrastructure Grant funds. During 1994, the City of Seattle and King County developed the details of a project to be jointly implemented and EPA awarded a $35 million Infrastructure Grant to the project.

The City completed construction of Phase 1 - a project to increase wet-weather capacity in the east and south Lake Union areas - in 1997. The City's Phase 2 project will connect their Phase 1 facilities to the County's Phase 3 and 4 facilities once these facilities are completed. Phase 3 (storage) and 4 (treatment) of the County's project were combined during the preliminary design phase so that at project completion, the CSOs to Elliott Bay and Lake Union in the project area will be controlled in compliance with state law. The Phase 3/4 project will control Lake Union and Denny Way CSOs by 1) storing CSO flows during small to moderate storms (< 0.5") and transferring them to the West Treatment Plant after the storm subsides; and 2) providing on-site treatment at the Elliott West site with discharge of treated flows through a new outfall during heavy rain conditions. This will reduce untreated discharges to Elliott Bay from approximately 50/yr to 1/yr. Facilities include:

- A 6,200 ft. long, 14'8" diameter tunnel under Mercer Street between Dexter Avenue North and Elliott Avenue West (for CSO storage, primary clarification and conveyance)
- CSO control facilities at the Elliott West site (with floatable removal, disinfection, and dechlorination)
- Piping and regulators to convey CSO flows from the existing County sewer system to the new facilities
- An outfall into Elliott Bay at Myrtle Edwards Park (to discharge treated flows from

the Elliott West facilities)

- An extension of the existing outfall at the Denny regulator at Myrtle Edwards Park (to discharge untreated CSO flows, expected to occur about once per year)

A general milestone schedule for project implementation is shown below:

Preliminary Design began	Spring 1997
Facilities Plan approved by Ecology	Fall 1998
Final Design began	Fall 1998
Construction began	2000
Construction complete	2004

A joint final State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS)/National Environmental Policy Act (NEPA) Environmental Assessment for Phases 2 and 3/4 was issued in July 1998.

Construction of the project is underway and is scheduled to be completed by the end of 2004. In 2002, construction was underway on all five construction contracts needed to implement the project. The Mercer Street Tunnel contract was substantially completed in fall 2002, including construction of the 6,200 ft. tunnel under Mercer Street and three tunnels under the railroad tracks west of the pump station site. The Marine Outfalls contract was also substantially complete. This contract included construction of two new outfalls in Elliott Bay. Construction under the Elliott West Pipelines contract was also well underway. The pipelines built under this contract will convey CSO flows to the new tunnel and treated flows to the new submerged outfall.

In late 2002, work began on the Elliott West CSO Control Facility and the South Lake Union Pipelines contracts. The pipelines contract will construct three new tunnels that will connect the existing collection system to the new CSO tunnel. The CSO Facility is being built at the downstream end of the Mercer Street Tunnel. Depending on the mode of operation, it will pump stored flows to the Elliott Bay Interceptor for treatment at West Point, or pump treated CSO flows to the new outfall to Elliott Bay. It is designed to operate automatically, with minimal staffing.

Construction of the entire project is expected to be complete in late 2004, with the start-up phase starting in the 4th quarter of 2004.

1.3.2.2 Henderson/Martin Luther King Jr. Way/Norfolk CSO Control Project

At the time of adoption of the 1988 Plan, the County believed that all King County CSOs into Lake Washington had been controlled to the one event per year level. However, subsequent monitoring data indicated that overflows at Henderson and M. L. King occurred more frequently than once per year.

As a result, in 1995 the County developed an engineering evaluation of the basin tributary to the Henderson/Martin Luther King Jr. Way CSOs to determine the sources and causes of the overflows at these locations, and identified interim and permanent corrective measures to control overflows. The evaluation also considered the impact of these measures on the downstream Norfolk regulator station. Based on this evaluation, the recommended alternative was to construct a 3.2-MG storage tank/CSO treatment facility near the Norfolk regulator station along with associated conveyance and pumping improvements.

During the 1997 predesign evaluation of alternatives, it was determined that a storage/treatment tunnel was more cost effective than the storage/treatment tank alternative. In addition, the storage tunnel had a conveyance system benefit, lower operation and maintenance, less adverse community impacts and was consistent with the approach being used on the Denny project. Therefore, the storage/treatment tunnel emerged from predesign as the preferred alternative. A 3,105 foot, 14'8" diameter storage/treatment tunnel is being built to achieve the one untreated event per year on average level of control.

The project elements and construction schedule are as follows:

Construction	Began	Ends
Henderson Pump Station	November 2001	November 2003
Tunnel and Pipelines	July 2002	December 2004

The project will be completed in segments. The project begins near the Atlantic City boat launch at South Seward Park Avenue South and South Henderson Street and terminates at the intersection of S. Norfolk Street and East Marginal Way South. Construction of the pipeline is a combination of underground tunneling and open-cut trenches. The pump station has been under construction since November 2001 and is 67 percent complete as of June 2003. The tunnel/pipeline construction has been underway since July 2002 and is 45% complete as of June 2003.

1.3.2.3 Carkeek Overflow Reduction Study

The Carkeek Overflow Reduction Study was initiated to investigate the causes of higher than anticipated flows to the Carkeek CSO treatment plant. This study supplements the work completed in the Facility Plan for the Carkeek Transfer/CSO Facilities Project issued for the Carkeek Facility in 1988. The study was a joint project with the City of Seattle (the local service provider in that area). It was completed in October 2001.

This study is associated, but not part of the CSO Control Plan. The Carkeek CSO Treatment Plant (on-line the end of 1994 and fully operational by the following wet season) was found to be receiving more influent flow than had been previously identified and planned. This placed the County in violation of the NPDES 5 yr. average permit volume limit of 14 million gallons per year (MGY) of treated discharge. The study found three main reasons for the higher actual flows than originally predicted:

1. flow data used for modeling the design of the Carkeek transfer and CSO plant was taken (mid-1980s) in what was, in retrospect, unusually dry years;
2. construction in the conveyance system prevented some higher flows from reaching the Carkeek facility during the planning and predesign phases. These flows are now captured as a result of system improvements by Seattle and King County and are sent to the Carkeek Pump Station and Carkeek CSO Treatment Plant.
3. the pumps were not performing to their specified ratings and thus the facility was not pumping the full 8.4 mgd design capacity.

Thus the service area now sends more flow to the Carkeek Facility than was originally expected and the pumps transferring the flow to West Treatment Plant, in combination with not pumping their own design capacity, were not designed to handle all the area's base flow.

King County has determined that up to 9.2 MGD is the appropriate base flow transfer rate (2.25 x Average Wet Weather Flow [AWWF]). With this new pumping rate and increased automation of the treatment plant pumping startup, it is predicted that treated discharges could occur up to 10 times per year (maximum 5-year average), and that the volume discharged per year could be up to 46 MGY (maximum 5-year average). The County has requested from Ecology a change of the NPDES permit limits to reflect these changes. The County is presently moving forward on a contract that will result in upgrading the station's pumping capacity to 9.2 MGD. Since continuous pumping at this rate would increase overflows to the Ship Canal, the upgrade to the Carkeek facility also includes level monitoring and controls at the Ship Canal overflow weir and a pump throttling algorithm at the Carkeek pump station. By providing pump throttling capability, the Carkeek pumping rate can be lowered based on pre-set criteria resulting from hydraulic modeling, so that no additional overflows at the Ship Canal are expected to occur because of the increased pumping flow from Carkeek from 8.4 mgd to 9.2 mgd. This throttling capability has been completed. Monitoring and fine tuning of the algorithm parameters will continue.

1.3.3 Future RWSP Projects

Table 1-3 lists all the CSO projects that comprise the CSO element of the RWSP. The table includes a brief description of the facilities to be constructed, and a proposed completion date. King County reserves the option to modify this schedule.

RWSP CSO Control Projects

Table 1-3

CSO Project	Project Description	Year Controlled
S. Magnolia	1.3 MG storage tank	2010
SW Alaska St.	0.7 MG storage tank	2010
Murray	0.8 MG storage	2010
Barton	Pump station upgrade	2011
North Beach	Storage tank and pump station upgrade	2011
Univ+Montlake	7.5 MG storage	2015
Hanford	3.3 MG storage/treatment tank	2017
West Treatment Plant Improvements	Primary/secondary enhancements	2018
Lander	1.5 MG storage/treatment @ Hanford	2019
Michigan	2.2 MG storage/treatment tank	2022
Brandon	0.8 MG storage/treatment tank	2022
Chelan	4 MG storage tank	2024
Connecticut	2.1 MG storage/treatment tank	2026
King St.	Conveyance to Connecticut treatment	2026
Hanford@Rainier	0.6 MG storage tank	2026
8th Ave S	1.0 MG storage tank	2027
West Michigan	Conveyance upgrade	2027
Terminal 115	0.5 MG storage tank	2027
3rd Ave. W.	5.5 MG storage tank	2029
Ballard	1.0 MG storage tank (40% King County)	2029
11th Ave. West	2.0 MG storage tank	2030

1.3.4 On-going Program Elements

1.3.4.1 CATAD Modifications

The Computer Augmented Treatment and Disposal System (CATAD) controls the West Point Treatment Plant collection system. Control system improvements were developed and brought on line in 1992 to improve utilization of storage capacity in existing sewers. The control system improvements included three components:

- Raising storage levels behind regulator stations;
- Lowering the wet well level at Interbay Pumping Station when rainfall was detected upstream, moving flow to West Treatment Plant sooner and vacating valuable storage space in the interceptor
- Incorporating an optimization program (Predictive Control), which monitors rainfall and conditions in the major trunks and interceptors, predicts inflows to the sewer system, and optimizes the regulation of flow through the regulators to minimize CSOs.

These modifications to the system were estimated to reduce CSO volumes by 150 MG per year when all were operating as designed. All three elements of the project were developed and underwent testing to assure reliability and effectiveness. Problems at the Interbay Pump Station and problems with the computer SCADA system hardware at the West Point Treatment Plant have prevented the use of the second and third components (pumping down the Interbay wet well and use of the Predictive Control program).

It has been determined that the control program for the existing Interbay pumps and wet well configuration can not be modified in a manner that will enable the wet well to be pumped down safely and reliably in advance of a storm. Air entrainment and cavitation that can damage the pumps and limit pumping capacity result when the wet well level is operated below the anti-vortexing tubes. A strategy of operating the wet well just above the anti-vortexing tubes has been proposed and is being tested. Such a strategy will provide most of the benefit that the CSO drawdown mode would have accomplished, because the peak flow rate is attained just 0.5 feet higher than it was proposed for CSO mode.

Currently, King County is replacing the SCADA computer hardware and software at West Point that monitors and displays the off-site station information. This upgrade will bolster the reliability of data acquisition and supervisory control of the regulator and pump stations. It will also provide adequate hardware for the CSO Predictive Control computer model to be updated so that it accurately represents the West Section conveyance system in order to optimize control of the collection system. Model updates and calibration will occur in 2004 – 2005, with full implementation of Predictive Control expected in 2006.

1.3.4.2 Lander and Densmore Stormwater Management Program

As a result of County sewer separation projects creating stormwater-only discharges, King County and the City of Seattle now jointly conduct a stormwater management program in the

Lander and Densmore drainage basins under the NPDES municipal stormwater permit. This is an on-going program that includes the following elements: source control, baseline sampling of stormwater discharges, and inspections. The maintenance of the stormwater system, the development of compliance schedules and enforcement actions are to be managed by the City of Seattle as specified in an interlocal agreement by and between the City of Seattle and King County.

1.3.4.3 CSO Notification Program

In order to meet state and federal requirements for public notification and to provide information to the community regarding the possible health impacts of CSOs, King County Department of Natural Resources & Parks (KCDNR&P), the Seattle-King County Health Department (SKCHD) and the City of Seattle Public Utilities (SPU) have collaborated on the development of a CSO Public Notification/Posting Program. Ecology was briefed on the program and accepted its development and components. This program includes posting warning signs at King County and City of Seattle CSOs, an information phone number for the public to contact the Seattle-King County Health Department (SKCHD) on questions concerning CSOs, a brochure, website, and other outreach efforts.

The CSO signs include a graphic and explanation of what CSOs are, the SKCHD information phone number, as well as a CSO number assigned to each site, which corresponds to its NPDES discharge serial number.

Due to the low volume of calls, (For the last six months there were approximately 10 calls of which half were not CSO related.) to the CSO Notification Information line to date, King County, City of Seattle, and the Seattle-King County Department of Health have decided to employ a message recorder that will be checked routinely.

Section 2 – 2002/03 CSO Volume and Frequency Summary

2.0 Introduction

The County's CATAD System monitors the volume and frequency of CSOs at King County regulator and pump stations in the West Treatment Plant system. Figure 1-1 at the front of this report shows the location of existing King County CSO discharges. The area south of the Ship Canal is referred to as the Southern Service Area, and the area north of the Ship Canal (including the Montlake and Dexter regulator stations) is referred to as the Northern Service Area. The County deploys portable flowmeters at the following seven CSO locations not currently monitored by CATAD: 11th Ave. NW, Alaska Street (SW), Hanford at Rainier, Henderson Street, Magnolia (South), Martin Luther King Jr. Way, and North Beach Pump Station (PS). Terminal 115 (038), overflow is not monitored due to difficult configuration and unsafe access. West Duwamish (035), will not be monitored unless inspections identify evidence that overflows may occur.

2.1 Rainfall

As shown on Table 2-1, rainfall measured by county rain gauges at pump and regulator stations for the 2002/03 year averaged 28.09 inches. This is 24 percent lower than the baseline average of 37 inches per year.

2.2 CSO Volumes

The total system overflow volume for 2002/03 was 548.71 million gallons (MG), compared to the 1981-83 baseline of 2,339 MG and are shown in Table 2-2.

The total CSO volume for 2002/03 represents a 76 percent total volume reduction over baseline conditions.

Figure 2-1 illustrates the progress King County has made in CSO volume as compared to total rainfall over time.

2.3 CSO Event Frequency

Table 2-3 contains the monthly frequencies and comparisons to baseline conditions for each station. There were a total of 157 CSO events of which 121 were from the Southern Service Area and 36 were from the Northern Service Area. For Total events this is a 64 percent reduction over the 1981/83 Baseline period.

Table 2-1
2002/2003 Rainfall at Pump and Regulator Stations
(in inches)

Station	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	2002/2003 Total
Ballard	1.03	0.54	0.07	0.52	0.36	2.34	5.26	6.94	1.42	4.71	2.02	1.12	26.33
Denny Local	0.83	0.55	0.19	0.44	0.47	2.64	5.24	7.01	1.48	4.87	2.21	1.31	27.24
Denny Way Lake Union	0.88	0.54	0.06	0.51	0.51	2.54	4.95	6.72	1.4	4.46	2.12	1.19	25.38
Kenmore	1.16	1.15	0.03	0.7	0.55	2.6	5.2	5.93	1.97	4.83	2.29	1.57	27.98
King Street	1.19	0.5	0.09	0.8	0.6	2.93	5.17	7.43	1.15	5.55	1.98	1.19	29.18
Marginal Way, E.	1.4	0.61	0.11	0.06	0.03	2.54	5.44	7.57	1.07	5.09	2.21	0.54	26.67
Matthews Park	1.33	0.76	0.11	0.62	0.45	2.97	5.5	6.87	1.69	5.43	2.77	1.55	30.05
Pine Street, E.	1.22	0.98	0.07	0.72	0.56	3.46	5.66	7.49	1.43	2.61	0	2.35	26.55
Rainier Avenue	1.34	0.73	0.15	0.64	0.64	3.02	6.4	8.28	1.26	5.96	2.29	0.83	31.54
University	1.34	0.64	0.19	0.62	0.4	2.98	5.6	7.15	1.58	5.42	2.98	1.53	30.43
Average	1.17	0.70	0.11	0.54	0.46	2.80	5.44	7.14	1.45	4.87	2.09	1.32	28.09

Notes:
1. E. Marginal Way rain gauge was not working properly in September and October 2002. Maintenance was performed at the end of October 2002.
2. E. Pine Street rain gauge was not working properly in March and April 2003.

Table 2-2

2002/2003 CSO Volume Summary

(in million gallons)

Station	DSN	Service Area	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	2002/03 Total	1983 Baseline
8th Ave. W. Marginal Way	040	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	8
Brandon St.	041	South	0.13	0.10	<0.01	<0.01	0.06	1.66	3.50	7.78	0.33	7.53	1.17	<0.01	22.26	64
Chelan	056	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	61
Connecticut	029	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	90
Denny Way	027	South	3.90	<0.01	<0.01	<0.01	<0.01	21.04	74.74	114.22	2.45	87.93	5.57	2.21	312.06	502
Duwamish P.S.	034	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
Hanford	031/2	South	0.01	<0.01	<0.01	<0.01	<0.01	1.66	16.29	36.72	<0.01	10.50	<0.01	<0.01	65.18	644
Harbor Ave.	037	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	36
Henderson (1)	045	South	<0.01	0.01	<0.01	<0.01	<0.01	0.10	2.70	5.01	<0.01	4.46	<0.01	<0.01	12.29	15
King Street	028	South	0.03	<0.01	<0.01	<0.01	<0.01	1.23	3.62	7.17	<0.01	5.32	0.26	0.05	17.68	55
Lander II St.	030	South	0.88	<0.01	<0.01	<0.01	<0.01	1.37	7.82	50.83	<0.01	24.93	2.50	<0.01	88.33	143
Magnolia, S. (1)	006	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.18	0.04	0.09	0.31	14
Marginal, E.	043	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
Michigan St.	039	South	<0.01	<0.01	<0.01	<0.01	<0.01	0.18	3.12	1.86	<0.01	5.82	0.44	<0.01	11.42	190
Michigan, W.	042	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.06	<0.01	<0.01	0.07	2
MLK Jr. Way (1)	013	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	60
Norfolk St.	044	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.71	<0.01	<0.01	0.71	39
Rainier Ave.	033	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
Terminal 115 (4)	038	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	2
11th Ave. NW (1)	004	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.14	0.15	
30th Ave. NE	049	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
3rd Ave. W.	008	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	0.06	<0.01	<0.01	<0.01	<0.01	0.14	106
Ballard	002	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	0.01	0.03	95
Belvoir	012	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
Canal St.	007	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1
Dexter	009	North	<0.01	<0.01	<0.01	<0.01	<0.01	1.13	1.90	1.24	0.07	0.16	0.37	0.21	5.08	24
Matthews Park	018	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
Montlake	014	North	<0.01	<0.01	<0.01	<0.01	<0.01	1.98	2.02	3.40	<0.01	1.49	0.72	0.39	10.00	32
North Beach (1)	048	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.44	0.44	6
Pine, E St.	011	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
University	015	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.31	0.21	<0.01	<0.01	<0.01	0.03	2.55	126
53rd Ave. SW	052	Alki	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
63rd Ave. PS	054	Alki	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
Alaska St. SW (1)	055	Alki	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1
Barton	057	Alki	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	8
Murray	056	Alki	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	6
TOTAL			4.95	0.11	0.00	0.00	0.06	30.35	118.12	228.51	2.85	149.11	11.07	3.57	548.71	2315
South			4.95	0.11	0.00	0.00	0.06	27.24	111.80	223.59	2.78	147.45	9.98	2.35	530.31	1925
North			0.00	0.00	0.00	0.00	0.00	3.11	6.32	4.92	0.07	1.66	1.09	1.22	18.39	390

Figure 2-1. Annual CSO Volumes

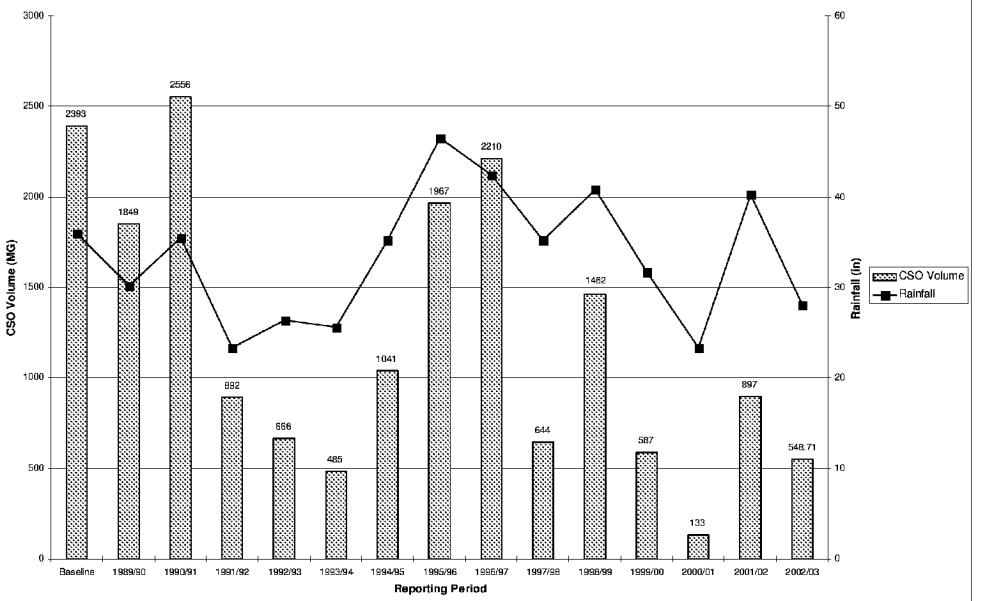

Table 2-3

2002/2003 CSO Event Frequency Summary

Station	DSN	Service Area	(Based on 24-hr. Inter-Event Interval – Baseline based on 48 hr. Inter-Event Interval) Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	2002/03 Total	1983 Baseline
6th Ave. W. Marginal Way	040	South	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Brandon St.	041	South	1	1	0	0	1	3	4	6	1	5	2	0	24	32
Chelan	036	South	0	0	0	0	0	0	0	0	0	1	0	0	1	7
Connecticut	029	South	0	0	0	0	0	0	0	0	0	0	0	0	0	23
Derny Way	027	South	1	0	0	0	0	3	2	8	1	2	2	2	21	25
Duwamish P.S.	034	South	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Hanford	031/2	South	1	0	0	0	0	3	2	10	0	3	0	0	19	63
Harbor Ave.	037	South	0	0	0	0	0	0	0	0	0	0	0	0	0	26
Henderson (1)	045	South	0	1	0	0	0	2	1	7	0	2	0	0	13	11
King Street	028	South	1	0	0	0	0	3	1	5	0	2	1	1	14	14
Lander II St.	030	South	1	0	0	0	0	1	1	5	0	2	1	0	11	22
Magnolia, S. (1)	006	South	0	0	0	0	0	0	0	0	0	2	2	2	6	21
Marginal, E.	043	South	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Michigan St.	039	South	0	0	0	0	0	1	1	3	0	2	1	0	8	32
Michigan, W.	042	South	0	0	0	0	0	0	1	0	0	2	0	0	3	5
MLK Jr. Way (1)	013	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	15
Norfolk St.	044	South	0	0	0	0	0	0	0	0	0	1	0	0	1	18
Rainier Ave.	033	South	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Terminal 115 (4)	035	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	3
11th Ave. NW (1)	004	North	0	0	0	0	0	0	0	0	0	2	0	1	3	14
30th Ave. NE	049	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
3rd Ave. W.	008	North	0	0	0	0	0	0	1	3	0	0	0	0	4	15
Ballard	003	North	0	0	0	0	0	0	0	1	0	1	0	0	2	13
Belvoir	012	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Canal St.	007	North	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Dexter	009	North	0	0	0	0	0	2	1	3	1	1	2	2	12	15
Matthews Park	016	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Montlake	014	North	0	0	0	0	0	2	2	3	0	2	1	1	11	5
North Beach (1)	048	North	0	0	0	0	0	0	0	0	0	0	0	1	1	17
Pine, E St.	011	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
University	015	North	0	0	0	0	0	0	1	1	0	0	0	1	3	12
53rd Ave. SW	052	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
63rd Ave. PS	054	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Alaska St. SW (1)	055	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Barton	057	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Murray	056	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	5
TOTAL			5	2	0	0	1	20	18	55	3	30	12	11	157	431
South			5	2	0	0	1	16	13	44	2	24	9	5	121	324
North			0	0	0	0	0	4	5	11	1	6	3	6	36	92

The following notes are for Tables 2-2 and 2-3.

(1) Portable flow meters; Not currently monitored by CATAD; PD indicates partial data for the month; NM indicates that a monitor failure occurred.
(2) Baseline for both CSO frequency and volumes have been revised since the 1988 final CSO Plan due to improvements made to the computer modeling system that provided more accurate projections on historical and future conditions
(4) Estimated by inspection. We have not been able to install a meter at this location.

2.4 Nine Minimum Controls Related Activities

King County has implemented a number of programs to satisfy the requirements of the Nine Minimum Controls, which are a part of EPA's CSO Control Policy. Those programs are summarized in Table 2-4.

Table 2-4: King County's Compliance with EPA's Nine Minimum Controls

Nine Minimum Controls	King County Compliance Effort
1. Proper operation and regular maintenance programs for the sewer system and CSOs	King County regularly maintains CSO outfalls, regulators, and pump stations through the West Treatment Plant, South Treatment Plant, and collection system maintenance divisions. Proper facility operation is managed by West Point staff using CATAD. Collection system staff inspect sewers on a specified schedule and perform corrective action when deficiencies are found. Maintenance schedules and records are available for inspection upon request.
2. Maximize use of collection system for storage	CATAD manages regulator stations to maximize flows in interceptors and store excess flows in large trunk sewers.
3. Review and modification of pretreatment requirements to ensure that CSO impacts are minimized	King County's Industrial Waste Program issues permits that set limits on the chemical contents of industrial discharges. The program also includes monitoring and permit enforcement, education and technical assistance to businesses on appropriate waste pretreatment and disposal techniques. King County also helps fund the Local Hazardous Waste Management Plan. Current water quality assessment and sediment management plan data indicate no need for CSO specific pretreatment program modifications.
4. Maximization of flow to secondary treatment plant for treatment	CATAD is used to maximize flow to the West Treatment Plant by operation of regulator and pump stations. All analysis for CSO control project alternatives include varying levels of storage and transfer to the secondary treatment plants.
5. Elimination of CSOs during dry weather	King County's maintenance and operations are directed at preventing dry weather overflows. Dry weather overflows may occur as a result of equipment malfunction or loss of power. The conveyance system is monitored through CATAD, and corrective action is taken immediately if a problem occurs. Equipment problems are immediately reviewed, and repair or replacement activity is undertaken in a timely manner. Dry weather overflows are reported to Ecology as sanitary sewer overflows.
6. Control of solid and floatable materials in CSOs	City of Seattle street sweeping and catch basin maintenance limit introduction of floatable materials to sewers.

Table 2-4: King County's Compliance with EPA's Nine Minimum Controls	
Nine Minimum Controls	King County Compliance Effort
7. Pollution prevention programs to reduce contaminants in CSOs	King County has implemented both the Industrial Waste Program and the Local Hazardous Waste Management Program to reduce discharge of chemicals and other substances that negatively impact the environment and the wastewater treatment process.
8. Public notification program to ensure that public receives adequate notice of CSO events and impacts	As a joint project with the City of Seattle and the Seattle King County Health Department, King County has developed a CSO Posting and Notification Program. This program includes posting signs at publicly accessible CSO locations, an information line, web site, brochure, telephone hotline, and other public outreach aspects.
9. Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls	Under the 1988 CSO Plan, King County's sampling program (now complete) included collecting data for five CSO sites per year. The King County 1999 CSO Water Quality Assessment found that majority of risks to people, wildlife, and aquatic life would not be reduced by removal of CSOs because most risk-related chemicals come from sources other than CSOs. King County may undertake additional sampling upon completion of specific CSO control projects.

2.5 CSO Treatment Plant Performance

In addition to secondary treatment of base sanitary sewage, the West Treatment Plant provides CSO treatment (equivalent to primary). CSOs that would otherwise overflow at points around the combined system, are captured and transferred to the West Treatment plant, and when the flow exceeds 300 mgd receives CSO treatment. The value of 300 mgd is derived from the rated secondary capacity of the West Treatment Plant of 133 mgd. The peak flow rate for the primary facilities is 440 mgd. The NPDES permit requires all flows up to 300 mgd, (2.25 x 133 mgd), to receive secondary treatment. All flows greater than 300 mgd receive CSO treatment and are then blended back into the secondary effluent for disinfection, dechlorination and discharge out the deep marine outfall. While the effluent limits to be met by the blended flow remain the typical secondary limits of 30 mg/l TSS and BOD5, during the wet season the plant is released from the 85 percent removal limits for TSS and BOD5 in recognition of the reduced CSO treatment removal efficiency.

Table 2-5 shows the dates and volumes of flow which received just CSO treatment. For the 2002/03 CSO year there were 22 days and a total of 266.40 million gallons.

Table 2.5					
2002/03 West CSO Annual Treatment (MG)					
Date*	Volume	Date	Volume	Date	Volume
28-Jun-02	0.50	03-Jan-03	0.01	13-Mar-03	2.14
12-Nov-02	0.38	04-Jan-03	18.19	21-Mar-03	15.22
16-Nov-02	9.02	12-Jan-03	4.81	22-Mar-03	6.54
14-Dec-02	36.60	13-Jan-03	2.90	13-Apr-03	6.04
15-Dec-02	6.07	22-Jan-03	19.83	04-May-03	6.46
16-Dec-02	9.53	25-Jan-03	1.00	16-Mar-03	3.09
01-Jan-03	32.79	16-Feb-03	6.58		
02-Jan-03	22.22	12-Mar-03	56.48	Total	266.40

* The dates do not represent individual CSO and/or storms events.

King County currently operates two CSO-only treatment facilities: the Alki and Carkeek CSO treatment plants. For the 2002/03 CSO year, Alki had two treated discharges with a total volume of 9.81 million gallons. Carkeek had four treated discharge events with a total volume of 3.88 million gallons. The following two appendices give a detailed report for each CSO treatment plant.

Appendix 1 - Alki CSO Plant Annual Report
June 2002—May 2003

This document is the fourth annual CSO report for the Alki CSO Treatment Plant, located in West Seattle. It summarizes Alki's performance and operation during the period of June 2002 through May 2003.

Alki previously operated under NPDES permit WA-002901-7 as a primary treatment plant. Alki ceased operation as a primary treatment facility on July 15, 1998. Though operated as a CSO treatment facility after October 1998, Alki was not incorporated into West Point's NPDES permit as a CSO treatment facility until Oct. 25, 1999 (WA-0029181-1). The annual reporting period for the Alki CSO facility is concurrent with the annual CSO reporting period: June 1-May 31.

Performance

The effluent limits for the Alki CSO facility are defined as follows:

- suspended solids (TSS) are limited to a yearly average of events of 60 mg/l or less
- settleable solids are limited to 1.9 ml/l/hr or less per event
- settleable solids are limited to a yearly average of 0.3 ml/l/hr or less
- number of discharge events per year is limited to an average of 29 based on the 5-year permit cycle, and the discharge volume is limited to an average of 108 million gallons per year based on the 5-year permit cycle.

The Alki CSO facility operated 3 times during the June 2002 – May 2003 reporting year. Two treated discharge events occurred in January and March. The West Seattle Pump Station pumped 18-20 MGD during both events. The discharge effluent for the year was within the permit requirements for suspended solids. The plant also met the yearly limit for the number of discharges and total discharge volume, as shown in the table below.

Settleable solids tests for all discharge events at the Alki CSO facility were done on the composite samples. The average of these results were reported in the monthly discharge monitoring reports The following table summarized the annual performance data for Alki since the time the plant has been incorporated into West Point's NPDES permit.

Alki Plant Operating Data, October 1999 through May, 2003

Year	Average TSS per Year mg/l	Average Settleable Solids per Year ml/l/hr	Discharge Flow per Year, MG	Discharge Events per Year	*once per year untreated event
	Limit = 60 mg/l	Limit = 0.3 ml/l/hr	Limit = 108	Limit = 29	
Oct 99 – May 00	26	0.15	4.00	2	No events removed

The above information was sent with the NPDES Renewal Package					
June 00 – May 01	No filling or discharge events				
June 01 – May 02	36	0.26	59.80	6	12/13/02 removed from average TSS and settleable solids calculation
June 02 – May 03	33	<0.10	9.81	2	No events removed

Operation and Maintenance

There has been some modifications made to the pumping strategy at the 63rd Street Pump Station. The strategy currently in-place is to have the three pumps that have variable speed drives come on first, after these pumps have reached maximum capacity and the wet well continues to rise, the three single fix speed pumps will come on. Communications of the pumping strategy were modified to minimize the frequency of high flow peaks.

Changes were made to improve effluent sampling at the Alki plant, including installing a hatch and fluorescent light over the grab sample location and installing an online pH analyzer.

The scum removal system at the Alki plant has been automated. During an event, the spray system will operate automatically based on the tank level. This improvement should increase the total solids removal.

The attached Tables provide information on the performance of the plant during the '02/03 reporting period.

Table 1.1 -- Alki CSO Plant Annual Report

Settleable Solids Performance

June 1, 2002 through May 31, 2003

Date	Effluent Event #	Settleable solids (ml/L/hr)	Event Maximum (ml/L/hr)	Comments
1/2/2003	1	<0.1	<0.1	composite sample
3/13/2003	2	<0.1	<0.1	composite sample
Annual Average		**<0.1**		

Table 1.2--TSS data for annual report

June 1, 2002 through May 31, 2003

Date	Influent Event Number	Influent flow, (MG)	Influent TSS, (mg/L)	Discharge Event Number	Effluent flow, (MG)	Effluent TSS, (mg/L)	Effluent TSS, (mg/L) "flow-weighted"	Effluent TSS lbs at Alki Discharged outfall
1/1/2003	1	0.88	84					
1/2/2003	1	9.87	58	1	7.11	35	35	2075
1/3/2003	1	1.76	58					
3/13/2003	2	3.43	33	2	2.70	28	28	631
3/22/2003	3	0.40	55					
Total	**3**	**16.34**		**2**	**9.81**			
Average							33.07	**2706**

Notes:

? Grab samples were taken at 5min (approximately), 30min, 2 hours, and 24 hours after discharge started. These times are simultaneous in time with the grab samples take for pH, chlorine, and Fecal Coliforms

? Annual event average = average of all event averages during the reporting year

? Flow data is reported daily from 00:00 hours to 23:59 hours.

? Discharge Event Eff TSS concentration (mg/l)=the total TSS load (lbs.) during the event / the total flow (MG) during the event =(Eff TSS, mg/l * Eff flow, mg * 8.34) / (Eff flow, mg) / 8.34

? Effluent TSS lbs discharged at Alki outfall (lbs.) = (effluent flow, mg)*(effluent TSS, mg/l)*8.34

Appendix 2– Carkeek CSO Plant Annual Report

June, 2002 – May, 2003

This document constitutes the eighth annual report of the Carkeek plant as a CSO facility. Carkeek began to operate as a CSO facility on November 1, 1994. The facility currently operates under Washington State Department of Ecology permit number WA-0029181-1 issued to the West Point Treatment Plant. The permit has been administratively extended by Ecology beyond the original expiration date of December 31, 2000 until the issuance of the new permit. The annual monitoring period is concurrent with the annual CSO reporting period, June 1 - May 31.

This report summarizes the performance and operation of the facility during June 2002 - May 2003.

Performance

As of July 1, 1998, Carkeek effluent limits are defined as follows:

- Discharge of suspended solids is limited to an annual average of events of 60 mg/l or less;
- Settleable solids is limited to 1.9 ml/l/hr or less per event;
- Settleable solids is limited an annual average of 0. 3 ml/l/hr or less;
- During the permit cycle, the facility flow limits are an average of 8 events and an average of 14 million gallons per year, to be averaged over 5 years;
- Ecology allows one event per year to be excluded from the calculation of solids treatment performance as the one untreated (or poorly treated) event per year.

Carkeek treatment plant had a relatively quiet year in comparison to the previous year. There were 12 inflow events and four discharge events for the entire reporting period. The total discharge flow was 3.88 MG, which is below the permit limit of an average of 14 million gallons per year, over the 5-year permit period. Without dropping any event, the discharge effluent Total Suspended Solids and Settleable Solids were significantly below the permit limits with annual averages of 30 mg/l and <0.1 ml/l/hr, respectively.

Total Suspended Solids and Settleable Solids tests were done on composite samples except for the December event and in one of the January events. Grab samples were analyzed during these events due to sampler problems. During the December event, the switchgear for both influent and effluent samplers was inadvertently left in the Off position after a line cleaning procedure. In the January 12, 2003 event, the gasket on the vacuum suction of the influent sampler was damaged. The problems were corrected quickly in both events to put the samplers back into service.

Table 1 summarizes the annual performance data for Carkeek Treatment Plant in the last 5 years.

Year	Average TSS per Year 1.052	Average SS per Year ml/l/hr	Discharge Flow per Year, MG	Discharge Events per Year		"once per year untreated event"
	Limit=60 mg/l	Limit=0.3 ml/l/hr	Limit=14 MG/YR	Limit=8/yr	%TSS Removal	
1999	24	<0.10	42.2	10	61	None
June 99-May 00	34	<0.10	8.39	6	76	None
June 00-May 01	0	0	0.11	1	89	10/20/2000
June 01-May 02	32	0.29	35.26	8	51	11/27/01
June 02– May 03	30	<0.10	3.88	4	73	None
5-year average	24	<0.10	17.95	6	70	

Operation and Maintenance

The Carkeek pump station was originally designed to pump 8.4 million gallons per day (MGD). A recommendation was made as a result of the Carkeek Overflow Reduction Study in 1999 to increase the pump station capacity to 9.2 MGD. The increase in pump capacity should reduce the number of discharge events at the treatment plant. During this reporting period, the pump drives were modified so the Carkeek pump station could pump 9.2 MGD with two pump sets in operation. Since the modification, the pump station has not had a big enough storm event to verify station output. Increasing the pumping capacity at Carkeek Pump Station has a potential of overflowing at 11th Ave Overflow weir. To prevent such a problem, instrumentation was installed at the 11th Ave weir to signal the potential for overflow so the pump station would automatically throttle back to 8.4 MGD. All three pump sets are tentatively scheduled for rebuild next year.

A recent study done by the PACE engineering group suggested that the capacity of the forcemain, which runs from the pump station to the main interceptor, was reduced by three to five percent or 0.28 to 0.46 MGD. The cause might be grit built-up in the forcemain. In August 2003, TV inspection of 2600 feet section of the forcemain revealed little built-up, but some wear and tear on the lining of the forcemain. Results of the inspection are currently being analyzed to determine the severity of the damage and plans for repairs. Other parts of the forcemain will be inspected or cleaned in the future.

Department of Ecology (DOE) has agreed to two changes on how the flow is reported monthly on the Discharge Monitoring Report (DMR) and Plant Monitoring Report (PMR). Flow data will be reported as total volume instead of the average and maximum values reported in the past. Total volume was considered to be a more useful value for the CSO plant, which operated only intermittently. Also it was clarified that, if an event fell on parts of two months, the event would be reported in the month that had the majority of the event's days.

Operational changes were made to improve disinfection and sampling procedures at the plant. New hypochlorite solution was ordered prior to the wet season to optimize disinfection. Feedback control loop was programmed in to ensure better control of final chlorine residuals. The sampling plan and procedures were reviewed at the annual refresher training session held in October of each year. Both Influent and Effluent samplers are scheduled to be purged weekly to keep them clean, operable and ready for an event.

In January, there was a leak caused by a break in a buried overflow pipe in the storage tanks section of the plant. Details of the event were provided to the Department of Ecology in an Unauthorized Discharge Report, dated January 6, 2003. The broken pipe was permanently capped to ensure there was no future reoccurrence.

In March, the CSO treatment plant experienced some minor problems with two Moore controllers. One controller, which controls the disinfection, was found reset to 0.0 mg/l. This problem may have been caused by an electrical glitch. The setpoint was corrected and the controller has been closely monitored. So far the problem has not recurred. Another controller which controls raw sewage pump set #3 failed. A new controller was installed.

The installation of the Automatic Transfer Switch (ATS) for the emergency standby generator has been completed and tested. The emergency standby generator provides backup power for the pump station and the treatment plant. In the event of a power outage, the ATS will detect the loss of city power; and it will start the generator and transfer the electrical load automatically to the generator. After the city power is restored, it will switch back automatically and shut off the generator.

Staff will continue to make improvements in training, planning and documentation to maintain smooth operation of the Carkeek CSO Treatment Plant. Please review the attached Tables 2 and 3 for information on the performance of the plant during the past reporting period.

Table 2--Carkeek CSO Plant Annual Report
Total Suspended Solids (TSS) Performance
June 1, 2002 - May 31, 2003

INFLUENT				EFFLUENT				
Date	**Inflow Event Number**	**Influent Flow (MG)**	**Influent TSS (mg/L)**	**Discharge Event Number**	**Effluent Flow (MG)**	**Effluent TSS (mg/L)**	**Discharge Event Effluent TSS (mg/L) "Flow Weighted"**	**Effluent TSS lbs of solids at Carkeek discharged outfall**
11/16/02	**1**	0.18	269					
12/12/02	**2a**	0.02	297					
12/14/02	**2b**	0.69	137	**1**	0.40	63	63.00	210.17
12/15/02	**2b**	0.10	137					
12/16/02	**2c**	0.23	34					
1/1/03	**3a**	0.33	88					
1/2/03	**3b**	1.47	88	**2a**	1.17	27		263.46
1/3/03	**3b**	0.10	117	**2b**	0.10	66		55.04
1/4/03	**3c**	0.63	112	**2c**	0.43	30	30.10	107.59
1/12/03	**4a**	0.11	49					
1/13/03	**4b**	0.03	116					
1/22/03	**5a**	0.33	173					
1/23/03	**5b**	0.06	227					
1/26/03	**6**	0.07	132					
2/16/03	**7**	0.25	112					
3/12/03	**8a**	0.57	39	**3a**	0.10	19		15.85
3/13/03	**8b**	1.42	66	**3b**	1.40	22	21.80	256.87
3/22/03	**9**	0.69	78	**4**	0.28	31	31.00	72.39
4/1/03	**10**	0.01	157					
4/13/03	**11**	0.05	139					
5/4/03	**12**	0.24	202					
Annual Average							**30.4**	
Annual Totals	**12**	**7.58**		**4**	**3.88**			**981.37**

Details on the above information are provided below:

Flow data is reported daily from 00:00 hours to 23:59 hours.

Sample data is taken from 07:00 hours to 07:00 hours.

Discharge Event Eff TSS concentration (mg/l) = the total TSS load (lbs.) during the event / the total flow (MG) during the event = (Eff TSS, mg/l * Eff flow, mg * 8.34) / (Eff flow, mg) / 8.34

Effluent discharged-outfall (lbs.) = (effluent flow, mg)*(effluent TSS, mg/l)*8.34

Table 3--Carkeek CSO Plant Annual Report
Settleable Solids Performance
June 1, 2002 through May 31, 2003

Date	Discharge Event Number	Settleable Solids (mls/L/hr)	Event Maximum (ml/l/hr)	Event Average (ml/l/hr)	Comments
12/14/02	**1**	<0.10	<0.10	<0.10	
1/2/03	**2a**	<0.10			
1/3/03	**2b**	<0.10			
1/4/03	**2c**	0.35	0.35	0.12	
3/12/03	**3a**	<0.10			
3/13/03	**3b**	<0.10	<0.10	<0.10	
3/22/03	**4**	0.10	0.10	0.10	
Annual Average				**<0.10**	

0.10 is the detection limit.
Calculation of average settleable solids values uses 0.0 when value is <0.10.
Event average = average of daily values during an event.
Annual event average = average of all event averages during the reporting year
Flow data is reported daily from 00:00 hours to 23:59 hours.
Sample data is taken from 07:00 hours to 07:00 hours.